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910 West Avenue, Austin, Texas 78701 USA

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BIOCHEMICAL MEASUREMENT DEVICE

Inventor:	Tamio Miyake Life Science Research Lab., Omron Corp. 3 Nakamikado-cho, Hanazono, Ukyo-ku, Kyoto-shi, Kyoto-fu
Applicant:	Omron Corporation 10 Todo-cho, Hanazono, Ukyo-ku, Kyoto-shi, Kyoto-fu
Agent:	Shigenobu Nakamura, patent attorney

[There are no amendments to this patent.]

Claim

A type of biochemical measurement device characterized by the fact that it has an isochromatic light emitter [face] that is compared with a color identification test paper by means of visual observation, a concentration setting means that sets the concentration, a driving means that drives said isochromatic light emitter to emit light at a color corresponding to the concentration set with said concentration setting means, and a display means that displays the concentration set with said concentration setting means.

Detailed explanation of the invention

Industrial application field

The present invention pertains to a type of biochemical measurement device that measures the concentration of a sample by means of color identification test paper.

Prior art

Color identification test paper is used in measuring the concentration of a substance to be detected in samples, such as the blood sugar value, urine sugar value, etc. As shown in Figure 6, when the concentration is read with said color identification test paper, a visual comparison is made between color chart (13) and color identification portion (12a) of the color identification test paper. Also, optical measurement of the color identification portion is possible. Figure 7 is a diagram illustrating an example of optical measurement. In this case, light from light emitting element (14) is irradiated on color identification portion (12a), and the light reflected from color identification portion (12a) is received with light receiving element (15). From the light receiving signal of light receiving element (15), the concentration is determined.

Problems to be solved by the invention

In the aforementioned method for reading the concentration using said color chart, a color chart is a necessity for performing the measurement. When there is no said color chart, measurement cannot be performed. This is undesirable. On the other hand, in said optical measurement, in addition to said light emitting element and light receiving element, there also has to be a driver for said light emitting element, a processing circuit for said light receiving element, and a holder for shielding off external scattered light. Consequently, the price of the device is high, and, at the same time, it is necessary to perform an operation to set said color identification test paper on said holder. This makes the operation tedious, and is undesirable.

The objective of the present invention is to solve the aforementioned problems of the prior art by providing a type of biochemical measurement device that can be easily and inexpensively operated without the need of a color chart.

Means to solve the problems and operation

In order to solve the aforementioned problems, the present invention provides a type of biochemical measurement device characterized by the fact that it has an isochromatic light emitter [face] that is compared with a color identification test paper by means of visual observation, a concentration setting means that sets the concentration, a driving means that drives said isochromatic light emitter to emit light at a color corresponding to the concentration set with said concentration setting means, and a display means that displays the concentration set with said concentration setting means. When said device is used in a measurement, the concentration is set with said concentration setting means so that the color of the light emitted from the isochromatic light emitter is equal to the color of the color identification test paper, and the concentration at this time is read with said display means. Setting of the concentration can be performed easily with buttons, etc. Also, since the color identification test paper and the isochromatic light emitter are compared visually, the operation is easy, the constitution of the device is simple, and the price of the device can be cut.

Application examples

In the following, the present invention will be explained in more detail with reference to an application example illustrated in Figures 1-5.

Figure 1 is an oblique view illustrating the appearance of biochemical measurement device (1) in the application example. Liquid crystal display unit (LCD: display means) (3), isochromatic light emitting face (4a), power button (5), and concentration setting buttons (6), (7) are set on upper surface (2a) of case (2). As shown in Figures 2(a), (b), isochromatic light emitting face (4a) emits light by means of 3-color light emitting diode LED (isochromatic light emitter) (4). In said 3-color light emitting element LED, red LED chip Cr, blue LED chip Cb and green LED chip Cg are set on stem (4d), and they are monolithically covered with light diffusion agent (4b). In the figure, (4c) represents a lead.

Figure 3 is a block diagram illustrating the constitution of the circuit of biochemical measurement device (1) in said application example. (8) represents concentration setting unit (8), which is connected to concentration setting switches (6a), (7a) manipulated by said concentration setting buttons (6), (7), respectively. The concentration set with concentration setting unit (8) is read in CPU (9). Also, power switch (5a) manipulated by said power button (5) and liquid crystal display unit (3) are connected to said CPU (9).

CPU (9) stores pulse widths W_r , W_g , W_b of pulses for driving said LED chips Cr , Cg , Cb , respectively, with respect to the concentration in a ROM contained in the CPU (or attached to it). Then, the pulse width with respect to the preset concentration is read by CPU (9) from ROM, and it is output to pulse width modulator (PWM) (10).

Based on the pulse width signal from CPU (9), said pulse width modulator (10) generates driving pulses Pr , Pg , Pb of said pulse widths W_r , W_g , W_b , respectively (see Figure 4). Based on said driving pulses Pr , Pg , Pb , LED driver (11) drives LED chips Cr , Cg , Cb . That is, LED chips Cr , Cg , Cb are turned ON under control of said pulse widths W_r , W_g , W_b , respectively, and the driving period of said LED chips Cr , Cg , Cb is much smaller with respect to the visual sense of the user for flickering. Also, as shown in Figure 5, it is possible to drive them with pulses at even higher frequency. LED driver (11) itself is controlled with gate signal g of CPU (9).

In biochemical measurement device (1) in this application example, when concentration setting button (6) is pressed, the concentration set with concentration setting unit (8) becomes higher. When concentration setting button (7) is pressed, the concentration becomes lower. When the concentration set in this way is displayed on liquid crystal display unit (3), light of the same color as that of the color identification test paper corresponding to said concentration is emitted from isochromatic light emitting face (4a).

When measurement is carried out, power button (5) is pressed, the power is turned ON, and, at the same time, color identification test paper (12) that has reacted to form a color due to the sample is set alongside isochromatic light emitting face (4a) (see Figure 1), and the two are visually compared with each other. At the same time, the user manipulates said concentration setting buttons (6), (7) until the color of isochromatic light emitting face (4a) becomes identical to that of color identification portion (12a) on said color identification test paper. When they display the same color, the concentration displayed on display unit (3) is the concentration of the sample.

In said application example, a 7-segment type LCD (8) is used to provide digital display of the concentration. However, it is also possible to appropriately change the design to display the result as judgments of $-$, \pm , $+$, etc., instead of the value of the concentration.

Effect of the invention

As explained above, the biochemical measurement device of the present invention has an isochromatic light emitter [face] that is compared with a color identification test paper by means of visual observation, a concentration setting means that sets the concentration, a driving means that drives said isochromatic light emitter to emit light at a color corresponding to the concentration set with said concentration setting means, and a display means that displays the concentration set with said concentration setting means. Consequently, the operation is easier,

the constitution is simpler, and the price of the device is lower. In addition, measurement without a color chart is possible. This is also an advantage.

Brief description of the figures

Figure 1 is an oblique view illustrating the appearance of a biochemical measurement device in an application example of the present invention. Figures 2(a) and (b) are a front view and a side view of the 3-color light emitting diode LED used in said biochemical measurement device. Figure 3 is a block diagram illustrating the constitution of the circuit of said biochemical measurement device. Figure 4 is a diagram illustrating the driving pulses for the 3-color light emitting diode LED of said biochemical measurement device. Figure 5 is a diagram illustrating another example of the driving pulses. Figure 6 is a diagram illustrating reading of the concentration using a color chart with prior art. Figure 7 is a diagram illustrating reading of the concentration by optical measurement with prior art.

- 3 Liquid crystal display unit
- 4 3-color light emitting diode LED
- 6, 7 Concentration setting button
- 8 Concentration setting unit
- 9 CPU
- 11 LED driver
- 12 Color identification test paper

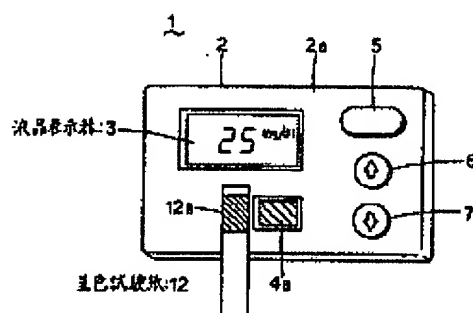


Figure 1

- Key: 3 Liquid crystal display unit
12 Color identification test paper

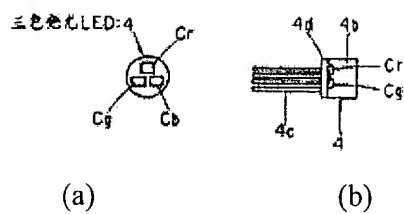


Figure 2

Key: 4 3-color light emitting diode LED

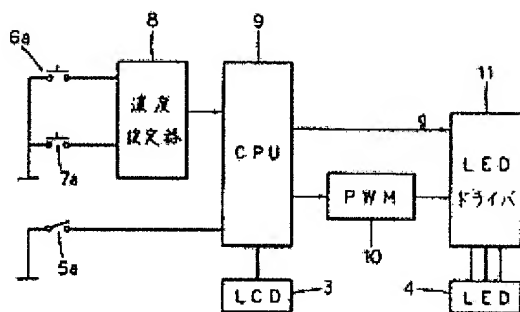


Figure 3

Key: 8 Concentration setting unit
11 LED driver

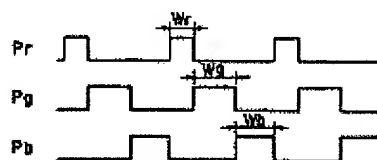


Figure 4

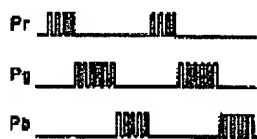


Figure 5

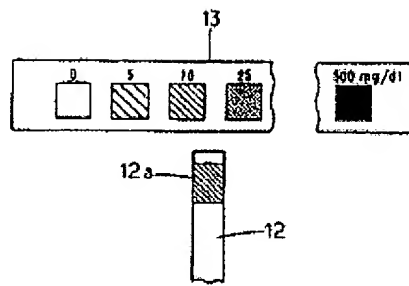


Figure 6

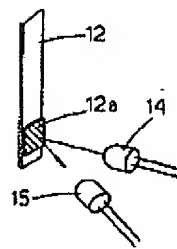


Figure 7

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審査請求 未請求 請求項の数 1 (全4頁)

⑭ 発明の名称 生化学測定装置

⑯ 特 願 平1-92113

⑰ 出 願 平1(1989)4月12日

⑱ 発 明 者 三 宅 民 生 京都府京都市右京区花園中御門町3番地 株式会社立石ライフサイエンス研究所内

⑲ 出 願 人 オムロン株式会社 京都府京都市右京区花園土堂町10番地

⑳ 代 理 人 弁理士 中村 茂信

明 細 書

1. 発明の名称

生化学測定装置

2. 特許請求の範囲

(1) 呈色試験紙と目視により比較される等色発光器と、濃度を設定する濃度設定手段と、この濃度設定手段で設定された濃度に対応する色で前記等色発光器を発光駆動する駆動手段と、前記濃度設定手段で設定された濃度を表示する表示手段とを備えてなる生化学測定装置。

3. 発明の詳細な説明

(イ) 産業上の利用分野

この発明は、呈色試験紙を用いて試料濃度を測定する生化学測定装置に関する。

(ロ) 従来の技術

血糖値や尿糖値等、試料中の被検出物質の濃度を測定するには、呈色試験紙が用いられる。呈色試験紙の呈色度より濃度を読み取るには、第6図に示すように、カラーチャート13と呈色試験紙の呈色部12aを目視により比較する。あるいは、

呈色部の光学的計測を行って読み取ることでもできる。第7図は、光学的計測の一例を示しており、発光素子14よりの光を呈色部12aに照射し、呈色部12aよりの反射光を受光素子15で受け、この受光素子15の受光信号より濃度を決定する。

(ハ) 発明が解決しようとする課題

上記カラーチャートを用いる濃度読み取り方法では、測定の際にカラーチャートが必ず必要であり、カラーチャートがない場合には、測定が行えない問題点がある。また、上記光学的計測の場合には、発光素子、受光素子のみならず、発光素子駆動回路、受光信号処理回路、外乱光を遮蔽するホルダ等が必要となり、装置の価格化が上昇すると共に、呈色試験紙を前記ホルダにセットするなど操作が煩雑である問題点があった。

この発明は、上記に鑑みなされたもので、カラーチャートが不要で安価かつ使い易い生化学測定装置の提供を目的としている。

(ニ) 課題を解決するための手段及び作用

上記課題を解決するため、この発明の生化学測

定装置は、呈色試験紙と目視により比較される等色発光器と、濃度を設定する濃度設定手段と、この濃度設定手段により設定された濃度に対応する色で前記等色発光器を発光駆動する駆動手段と、前記濃度設定手段で設定された濃度を表示する表示手段とを備えてなるものである。測定に際しては、呈色試験紙と同じ色で等色発光器が発光するように濃度設定手段で濃度を設定し、その時の濃度を表示手段より読み取る。濃度の設定は、ボタン等で容易に行え、また呈色試験紙と等色発光器とを目視により比較するから操作が簡単で、装置の構成も簡略化できて低価格化を図ることができる。

(ホ) 実施例

この発明の一実施例を第1図乃至第5図に基づいて以下に説明する。

第1図は、実施例生化学測定装置1の外観斜視図を示している。ケース2の上面2aには、液晶表示器(LCD:表示手段)3、等色発光面4a、電源ボタン5、濃度設定ボタン6、7が配備され

変調器(PWM)10に出力する。

パルス幅変調器10は、CPU9よりのパルス幅信号に基づいて、これらパルス幅Wr、Wg、Wbの駆動パルスPr、Pg、Pbを発生する(第4図参照)。これら駆動パルスPr、Pg、Pbに基づいて、LEDドライバ11が実際にLEDチップCr、Cg、Cbを駆動する。すなわち、LEDチップCr、Cg、Cbは、パルス幅Wr、Wg、Wbにより制御されて点灯されており、各LEDチップCr、Cg、Cbの駆動周期は、ちらつきに対する視感度に比して十分速いものとされている。また、第5図に示すように、さらに高い周波数のパルスで変調して駆動するようにしてもよい。なお、LEDドライバ11自身は、CPU9のゲート信号gにより制御されている。

この実施例生化学測定装置1では、濃度設定ボタン6を押せば濃度設定器8で設定される濃度が高くなっていき、濃度設定ボタン7を押せば逆に濃度が低くなっていく。こうして設定された濃度は液晶表示器3に表示されると共に、この濃度に

対応する呈色試験紙の色と同じ色の光が、等色発光面4aより発せられる。

測定を行う際には、電源ボタン5を押して電源をオンにすると共に、試料により呈色反応を生じた呈色試験紙12を等色発光面4aの傍にもっていき(第1図参照)、両者を目視で比較しながら、濃度設定ボタン6、7を操作し、等色発光面4aが呈色試験紙呈色部12aと同じ色になるようにする。同じ色になった時、表示器3に表示されている濃度が試料の濃度となる。

なお、上記実施例では、LCD8に7セグメント型のものを用い、濃度をデジタル表示しているが、濃度に代えて-、±、+等の判定性表示としてもよく適宜設計変更可能である。

(ヘ) 発明の効果

以上説明したように、この発明の生化学測定装置は、呈色試験紙と目視により比較される等色発光器と、濃度を設定する濃度設定手段と、この濃度設定手段により設定された濃度に対応する色で前記等色発光器を発光駆動する駆動手段と、前記

濃度設定手段で設定された濃度を表示する表示手段とを備えてなるものであるから、操作が容易で、また構成が簡単であるから装置の低価格化を図ることができる。さらに、カラーチャートがない場合でも測定が行える利点を有している。

4. 図面の簡単な説明

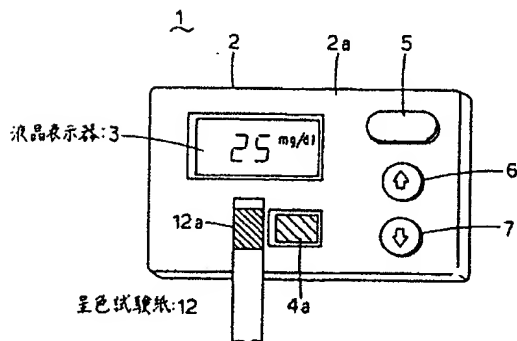
第1図は、この発明の一実施例に係る生化学測定装置の外観斜視図、第2図(a)及び第2図(b)は、それぞれ同生化学測定装置に使用される三色発光LEDの正面図及び側面図、第3図は、同生化学測定装置の回路構成を説明するブロック図、第4図は、同生化学測定装置の三色発光LEDの駆動パルスを説明する図、第5図は、この駆動パルスの他の例を説明する図、第6図は、従来のカラーチャートを用いた濃度読取りを説明する図、第7図は、従来の光学的計測による濃度の読取りを説明する図である。

3：液晶表示器、 4：三色発光LED、
6・7：濃度設定ボタン、8：濃度設定器、
9：CPU、 11：LEDドライバ、

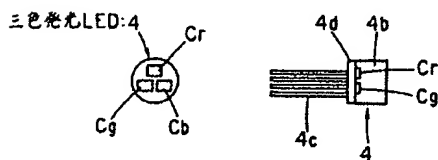
12：呈色試験紙。

特許出願人 立石電機株式会社
代理人 弁理士 中村茂信

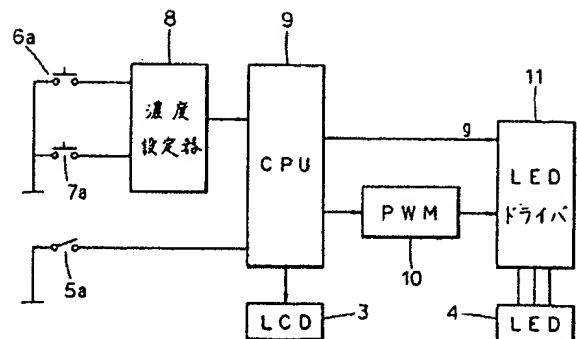
第1図



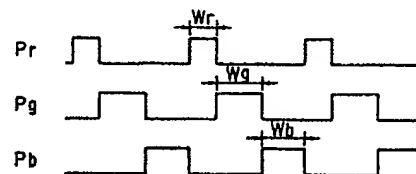
第2図(a) 第2図(b)



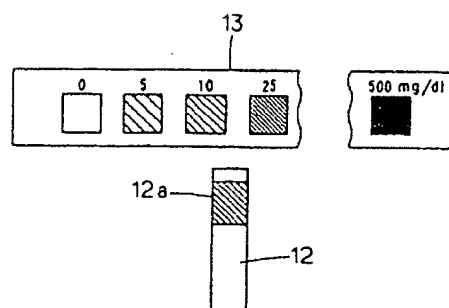
第3図



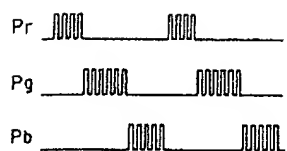
第4図



第 6 図



第 5 図



第 7 図

